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Quality of western Canadian flaxseed 2016

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Table of contents

Introduction 3

Summary 4

Weather and production review 5
Weather review, seeding and growing conditions 5
Production and grade information 5

Harvest samples 6

Quality data by province and western Canada 7
Oil content 9
Protein content 10
Free fatty acids content 11
Fatty acid composition 12

Tables

Table 1 – Flaxseed, No. 1 Canada Western
Quality data for 2016 harvest 5

Table 2 – Flaxseed, No. 1 Canada Western
Fatty acid composition for 2016 harvest 5

Table 3 – Seeded area and production for western Canadian flaxseed 7

Table 4 – Quality data for 2016 western Canadian flaxseed 9

Table 5 – Fatty acid composition and free fatty acids content of 2016 Canadian flaxseed 9

Figures

Figure 1 – Map of Prairie provinces showing traditional growing areas for flaxseed 4

Figure 2 - Flaxseed, No. 1 Canada Western
Oil content of harvest samples, 2006–2016 10

Figure 3 - Flaxseed, No. 1 Canada Western
Protein content of harvest samples, 2006–2016 11

Figure 4 - Flaxseed, No. 1 Canada Western
Free fatty acids content of harvest samples, 2006–2016 12

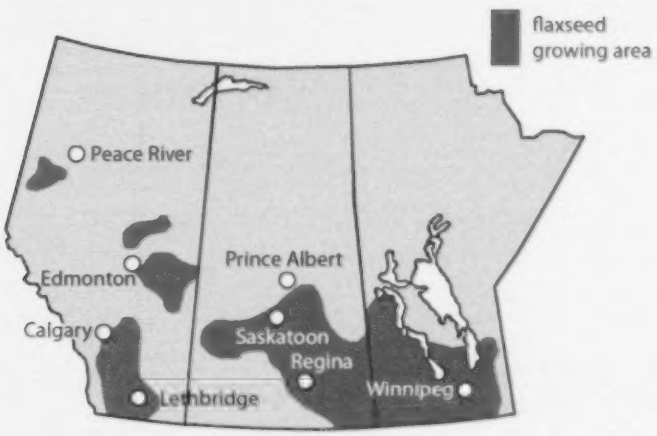
Figure 5 – Flaxseed, No. 1 Canada Western
Linolenic acid content of harvest samples, 2006–2016 14

Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest samples, 2006–2016 15

Introduction

This report presents quality data and information based on samples of western Canadian flaxseed from the Canadian Grain Commission's 2016 Harvest Sample Program. The quality data includes oil, protein, free fatty acids, fatty acid composition and iodine values of harvest samples submitted to the Grain Research Laboratory. Producers and grain companies submitted the samples throughout the harvest period. The map shows the Prairie provinces, the traditional growing areas for flaxseed in western Canada.

Figure 1 – Map of Prairie provinces showing traditional growing areas for flaxseed



Source: Flax Council of Canada

Summary

The Canadian Grain Commission's Harvest Sample Program of western Canadian flaxseed shows that the 2016 crop contains similar oil content, higher protein content and slightly lower iodine values when compared to the 2016 harvest.

Table 1 shows data for Flaxseed, No. 1 Canada Western. Oil content is 45.6%, which is similar to the 2015 mean (45.7%) and the same as the 10-year mean (45.6%). Protein content is 21.9% and is lower than the 2015 mean (22.5%) and the 10-year mean (22.3%). Iodine value is 192.2 units, which is 0.7 units higher than the 2015 value of 191.5 units.

Environmental factors can play an important role in oil and protein content trends, as well as fatty acid composition. The Grain Research Laboratory's long-term harvest sample results have shown cool, wet growing conditions tend to produce a flaxseed crop with higher oil content and iodine values and lower protein content.

Table 1 - Flaxseed, No. 1 Canada Western Quality data for 2016 harvest

Quality parameter	2016	2015	2006-15 Mean
Oil content[1], %	45.6	45.7	45.6
Protein content[2], %	21.9	22.5	22.3
Free fatty acids, %	0.19	0.19	0.17
Iodine value	192.2	191.5	191.6

[1] Dry matter basis
[2] N x 6.25; Dry matter moisture basis

Table 2 - Flaxseed, No. 1 Canada Western
Fatty acid composition for 2016 harvest

Fatty acid[1], % in oil	2016	2015	2006-15 Mean
Palmitic acid (C16:0)	5.2	4.9	5.0
Stearic acid (C18:0)	3.5	3.5	3.4
Oleic acid (C18:1)	18.1	18.8	18.6
Linoleic acid (C18:2)	14.7	14.6	15.5
α-Linolenic acid(C18:3)	57.8	57.2	56.3

[1] Percentage of total fatty acids in the oil including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Weather and production review

Weather review, seeding and growing conditions

The 2016 growing season for flaxseed growers began with a concern about the lack of soil moisture. The early dry spring allowed seeding to being in early May so by the end of May nearly 86% of the crop was seeded. The crop was developing well in June because of timely rains and warmer than average temperatures. In July we had above average precipitation and cooler temperatures giving the promise for above average flaxseed yields. By the end of July over 90% of the crop was considered either good or excellent in Saskatchewan. The flaxseed harvest started in mid-September but was slowed by rains so by mid-October only 50% of the crops were harvested in Saskatchewan and Manitoba. The second week in October saw significant rain and snow in Saskatchewan, Alberta and some parts of Manitoba which stalled the progress of the harvest for several weeks. With warm, dry weather in November harvesting advanced but still significant percentage of the crop remained in the field.

Source: http://www.agriculture.gov.sk.ca/crop-report; http://www.gov.mb.ca/agriculture/crops/seasonal-reports/crop-report-archive/, http://www1.agric.gov.ab.ca/$Department/deptdocs.nsf/All/sdd4191

Temperature and precipitation patterns for the 2016 western Canadian growing season can be found on Agriculture and Agri-Food Canada's web site (http://www.agr.gc.ca/DW-GS/historical-historiques.jspx?lang=eng&jsEnabled=true).

Production and grade information

Western Canadian farmers seeded 378 thousand hectares of flaxseed in 2016 (Table 3), which is a significant decrease compared to 2015 (665 thousand hectares). The 2016 yield estimate of 1,700 kilograms per hectare was higher than the yield reported in 2015 (1,500 kilograms per hectare) and higher than the 10-year mean of 1,390 kilograms per hectare. Flaxseed production decreased by 363.2 thousand metric tonnes from last year's 942.3 thousand metric tonnes. In Manitoba, Saskatchewan and Alberta production decreased to 50,800, 473,700 and 54,600 metric tonnes, respectively when compared to 2015 production values (Statistics Canada). Saskatchewan accounted for 81.8% of flaxseed production while Manitoba and Alberta had 8.8% and 9.4%, respectively.

Over 86% of the samples received for the Canadian Grain Commission's 2016 Harvest Sample Program were graded as Flaxseed, No. 1 Canada Western at the time of our quality analysis. This percentage is expected to go down as late harvested, 'snowed-on' flaxseeds are analyzed. The primary reason for grade reduction in this year was because of low test weights.

Table 3 - Seeded area and production for western Canadian flaxseed[1]

	Seeded area		Production		Average production
	2016	2015	2016	2015	2006-15
	thousand hectares		thousand tonnes		thousand tonnes
Manitoba	34	51	50.8	71.1	105.8
Saskatchewan	316	567	473.7	787.4	570.6
Alberta	28	47	54.6	83.8	48.6
Western Canada	**378**	**665**	**579.1**	**942.3**	**725.0**

[1] **Source:** Statistics Canada. *Table 001-0010 - Estimated areas, yield and production of principal field crops in metric units.* (http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0010010&paSer=&pattern=&stByVal=1&p1=1&p2=-1&tabMode=dataTable&csid)

Harvest samples

Flaxseed samples for the Canadian Grain Commission's Harvest Sample Program are collected and cleaned to remove dockage prior to testing. The samples are analyzed for oil, protein and iodine value using a Foss NIR Systems 6500 scanning near-infrared spectrometer, calibrated to and verified against the appropriate reference method. Composite samples are used for free fatty acids and fatty acid composition analyses. Composites are prepared by combining samples by province for Flaxseed, No.1 Canada Western. Composites of Flaxseed, No. 2 Canada Western, Flaxseed, No. 3 Canada Western and Sample Grade combine all samples from western Canada by grade.

This year's harvest report includes 224 samples compared to 296 in 2015. Manitoba contributed 34 samples of Flaxseed, No. 1 Canada Western, Saskatchewan 132 samples, and Alberta 26 samples during the harvest period from September 1st to December 1st, 2016. There were 15 samples that were graded as Flaxseed, No. 2 Canada Western, 16 as No. 3 Canada Western and one graded Sample.

Quality data by province and western Canada

Tables 4 and 5 show detailed information on the quality of top grade western Canadian (CW) flaxseed harvested in 2016. Of the flaxseed samples submitted to the Grain Research Laboratory, 86% were graded as No. 1 Canada Western with the remaining 14% consisting of No. 2 Canada Western, No. 3 Canada Western and Sample grade. The number of harvest samples collected from each province may not represent the actual production or grade distribution. However, there were sufficient samples to provide good quality information for each province. To calculate western Canadian averages, provincial averages are weighted by the Statistics Canada production estimate and an estimate of grade distribution.

Oil and protein content give quantitative estimates of the value of the seed as a source of oil and of the resulting meal as a source of protein for animal feed. Alpha-linolenic acid is an omega-3 fatty acid which literature has shown can play an important role in maintaining good health in humans and animals (www.flaxcouncil.ca). It is the main factor in the increased use of whole and ground flaxseed in cereals and baked goods, and flaxseed oil in salads. Flaxseed is also used in animal feeds, for example in chicken to produce omega-3 eggs.

Iodine value is a measure of the overall unsaturation of the oil and can be calculated from the fatty acid composition. Oils with higher iodine values, i.e., with more unsaturation, polymerize more rapidly in the presence of air. In flaxseed, iodine value is directly related to the amount of alpha-linolenic acid present in the oil. Alpha-linolenic acid is one of the most important quality factors for industrial use as it is responsible for most of flaxseed oil's drying properties.

Table 4 - Quality data for 2016 western Canadian flaxseed

Province/Grade	Number of samples	Oil content[1], %			Protein content[2], %			Iodine value		
		Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
No. 1 CW	**192**	**45.6**	**41.4**	**49.7**	**21.8**	**17.2**	**25.6**	**192.2**	**178.7**	**203.5**
Manitoba	34	45.2	42.0	48.4	22.2	18.6	24.9	190.3	182.5	197.5
Saskatchewan	132	45.6	41.4	49.7	21.5	17.2	24.9	192.6	178.7	203.5
Alberta	26	45.5	42.0	48.1	23.3	18.5	25.6	192.4	181.9	197.2
No. 2 CW	15	45.6	41.7	49.8	21.4	18.5	24.8	192.4	186.6	198.0
No. 3 CW	16	45.6	42.4	48.2	21.3	18.3	23.3	193.0	185.0	200.1
Sample	1	44.5	-	-	17.8	-	-	196.5	-	-

[1] Dry matter basis
[2] N x 6,25; dry matter basis.

Table 5 – Fatty acid composition and free fatty acids content of 2016 Canadian flaxseed

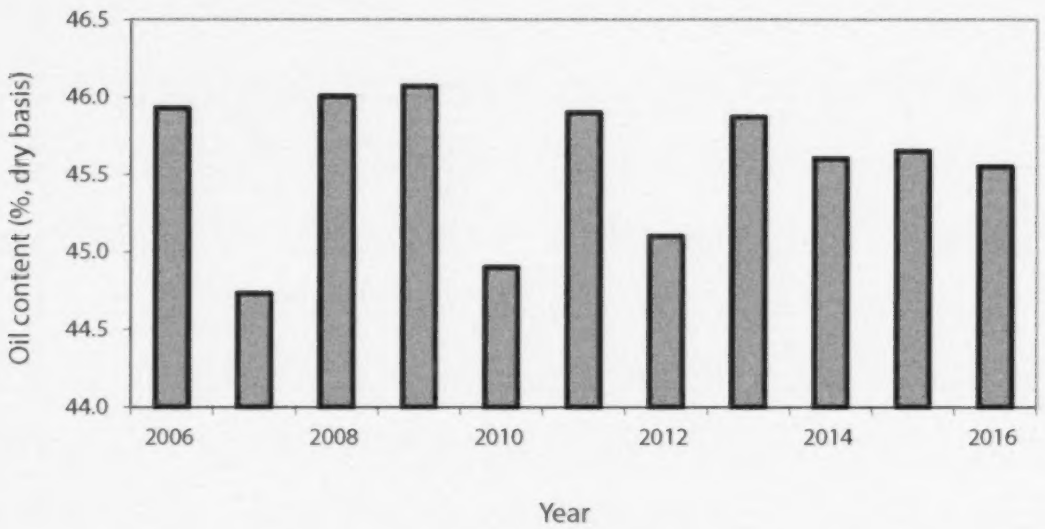
Province/Grade	Number of samples	Fatty acid composition, %[1]					Free fatty acids
		C16:0	C18:0	C18:1	C18:2	C18:3	
No. 1 CW	**192**	**5.2**	**3.5**	**18.1**	**14.7**	**57.8**	**0.19**
Manitoba	34	5.3	3.7	18.2	15.2	56.6	0.37
Saskatchewan	132	5.2	3.4	18.0	14.5	58.1	0.14
Alberta	26	5.0	3.4	18.1	14.8	57.7	0.18
No. 2 CW	15	5.1	3.6	18.0	14.3	58.1	0.25
No. 3 CW	16	5.2	3.3	17.5	15.1	57.9	0.34
Sample	1	5.2	3.0	16.5	14.4	60.1	1.85

[1] Percentage of total fatty acids in the oil including palmitic (C16:0), stearic (C18:0), oleic (C18:1), linoleic (C18:2), and linolenic (C18:3)

Oil content

Average oil content (45.6%) in Flaxseed. No. 1 Canada Western is similar to the 2015 average (45.7%) and is identical to the 10-year mean (45.6%) (Figure 2). Average oil content for Manitoba (45.2%) is lower than the average in Saskatchewan (45.6%) and Alberta (45.5%) (Table 4). Oil content for Flaxseed, No. 1 Canada Western samples from producers across western Canada ranged from 41.4 to 49.7% (Table 4).

Figure 2 – Flaxseed, No. 1 Canada Western
Oil content of harvest samples, 2006-16

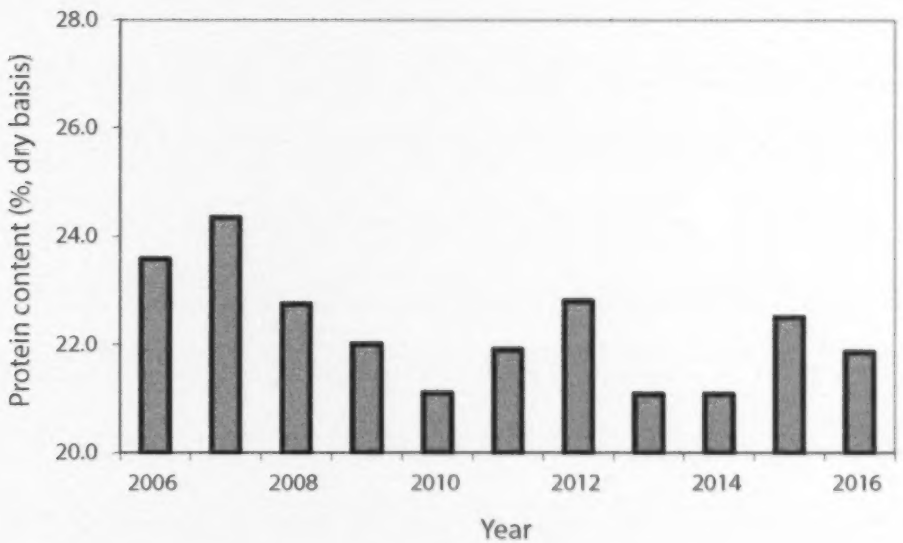


2016 average	45.6%
2015 average	45.7%
2005–15 mean	45.6%

Protein content

Average protein content (21.9%) for Flaxseed, No.1 Canada Western is lower than the 2015 harvest average (22.5%) and similar to the 10-year mean (22.3%) (Figure 3). The average in Manitoba (22.2%) is higher than the average in Saskatchewan (21.5%) but lower than the average in Alberta (23.3%). Protein content for Flaxseed, No. 1 Canada Western samples from producers across western Canada ranged from 17.2 to 25.6% (Table 4).

Figure 3 – Flaxseed, No. 1 Canada Western
Protein content of harvest samples, 2006–16



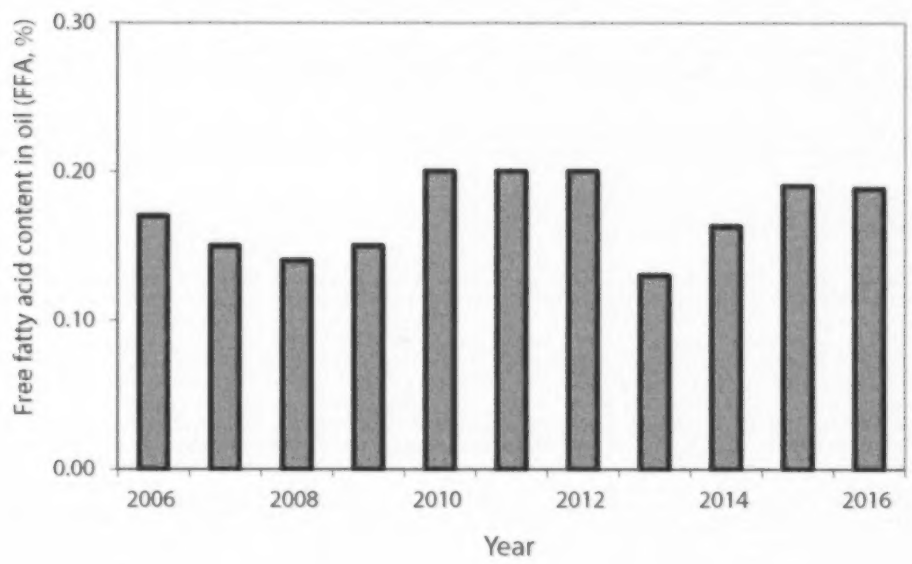
2016 average	21.9%
2015 average	22.5%
2006–15 mean	22.3%

Free fatty acids content

Average free fatty acids content (0.19%) in Flaxseed, No. 1 Canada Western is identical to the average in 2015 (0.19%) and slightly higher than the 10-year mean (0.17%) (Figure 4). The average in Manitoba (0.37%) is higher than the average in Saskatchewan (0.14%) and to the Alberta average (0.18%) (Table 5). Higher values are mainly due to seed damage.

Samples that graded No. 2 and No. 3 Canada Western had an average free fatty acids content of 0.30%.

Figure 4– Flaxseed, No. 1 Canada Western
Free fatty acid content of harvest samples, 2006–16



2016 average	0.19%
2015 average	0.19%
2006–15 mean	0.17%

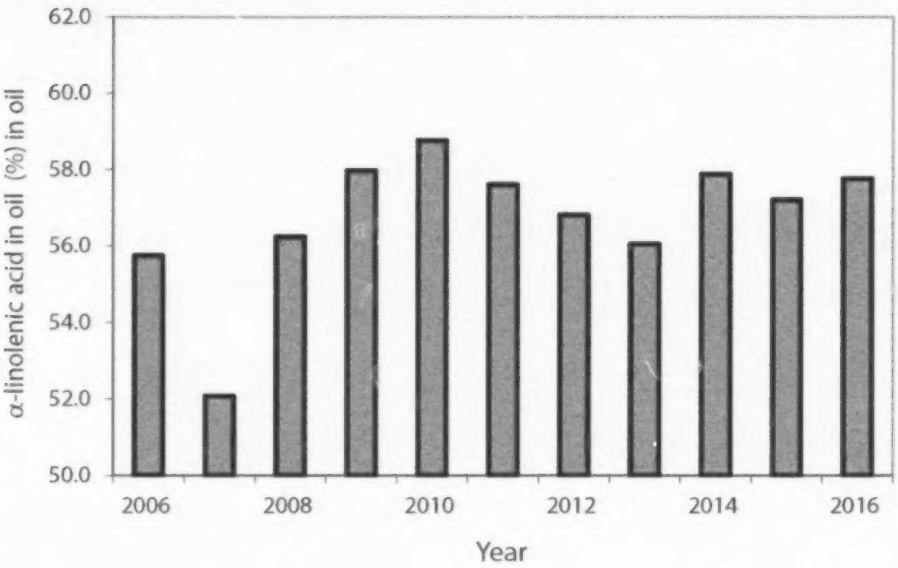
Fatty acid composition

Average alpha-linolenic acid (C18:3) content (57.8%) in Flaxseed, No. 1 Canada Western is slightly higher than the average in 2015 (57.2%) and higher than the 10-year mean (56.6%) (Figure 5).

The average iodine value of the oil from Flaxseed, No. 1 Canada Western samples is 192.2 units. Iodine value is a measure of the total degree of unsaturation of the oil and, in flaxseed, is heavily influenced by the alpha-linolenic acid content of the oil. The 2016 iodine value is 0.7 units higher than in 2015 and 1.5 units higher than the 10-year mean of 190.7 units (Figure 6). Iodine values for Flaxseed, No. 1 Canada Western samples from producers across western Canada varied from 178.7 to 203.5 units.

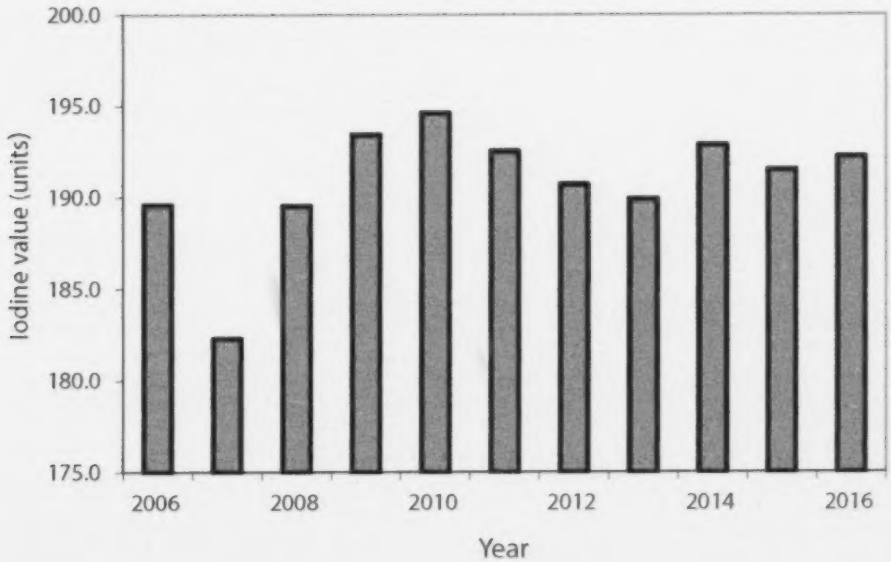
Usually oils with iodine values greater than 188 units are desired by the coatings industry for products such as paints, varnishes and inks, while oils with iodine values around 183 units are preferred by the linoleum industry. Iodine value, like oil content, is influenced by growing temperatures and length of photoperiod.

Figure 5 – Flaxseed, No. 1 Canada Western
Percent α–Linolenic acid content of harvest samples, 2006–16



2016 average	57.8%
2015 average	57.2%
2006–15 mean	56.6%

Figure 6 – Flaxseed, No. 1 Canada Western
Iodine value of harvest samples, 2006–16



2016 average	192.2
2015 average	191.5
2006–15 mean	190.7